



Mouse Trap Cars

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Target Grade: 4th grade

Time Required: 90 to 120 minutes (3 day activity)

Standards:

- **4- PS3-1.**
Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- **4- PS3-3.**
Ask questions and predict outcomes about the changes in energy occur when objects collide.
- **4- PS3-4.**
Apply scientific ideas to design, test, and refine a device that comes from energy from one form to another.
- CCSS.ELA-LITERACY.W.4.2
Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
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Lesson Objectives:

Students will:

- Know how to construct an explanation relating to speed from an object that produced it.
- Understand different designs will produce different speeds and distances of their cars.
- Be able to design a mouse trap car to test their hypothesis on the speed of an object relating to energy.

Central Focus:

In this lesson students will design a car whose center is made out of a mouse trap. This model will help students understand the way they design an object has an effect on the overall speed. At the end of this lesson, students will be able to understand and write a informative essay on the way their car is built such as the size of the wheels, lever, and amount of tension will all play a role in how much energy their model will produce.

Background Information:



Before beginning this activity, students should be taught the definitions of speed, energy, friction, torque, and Newton's law of motions in extensive detail.

Materials

Teacher:

- Anchor chart
- Example car

To build mouse trap lever cars per group

- Two wooden sticks (home depot throw away rulers, see example picture below)
- One mouse trap
- Empty pen or plastic tube
- String
- Cylinder rods for axles
- 4 wheels of student choosing.

Instruction

Day 1 Introduction:

Step 1. The teacher will call the class to the front of the board where the anchor chart is located. As a group the class will discuss energy and speed. The teacher will write student points on the anchor chart. The teacher will emphasize that if an object has greater potential energy it will travel at a greater speed.

Step 2. Teacher models (5 to 10 minutes): The teacher will demonstrate how the mouse trap car is supposed to work. Students will be shown each of the available supplies and explain how little details will impact the speed and distance of their car greatly. Students will then be split into groups of 4. See page labeled "1" for example of mouse trap car.

Step 3. Each group will receive a blank piece of paper (15 to 20 minutes): You will all now create a design for your mouse trap car. Label your design and provide yourselves notes so you can build your car with little hesitation.

Day 2. Building the model:

Step 4. Let each group review their design and begin building (45 to 60 minutes): If your group has finished your design, you may begin building. Please utilize your time wisely. Tomorrow we will collect our data and see whose car travels at a faster speed and longer distance.

Day 3. Observing and testing:



Step 5. **Students will be given time to practice run their cars (15 minutes):** You now have time to test out your cars. Make sure you write down why your car is going the speed and distance that you see based on your design. You have about 15 minutes for trial runs.

Step 6: **Bring class together as a whole and let each group present their model to the class: (15 to 20 minutes):**. On your anchor chart record the time it takes for each groups car to travel from a one point in the room to another. Students will be taught at this point to take the distance/time= speed. The winning car will be the car that traveled the farthest distance and the car that went at the greatest. The class will discuss why they believe the design of the of winning cars played a part in how much energy was transferred per car.

Step 7. **Have each student write an informational essay :** Your essay should be informational. Please include directions on how to build your mouse trap car and how each detail related to the energy produced. Turn this into me when you are done.

Differentiation

Students will be grouped up in high performing students and low performing students. This ensures that the groups are equal, and students can help each other as they progress through the activity.

The teacher will model how to work the example car and write key words on the anchor chart. This will serve as a visual to students throughout the lesson.

Assessment

Formative:

Students will be graded on how the design and effort put into their mouse trap car using a standard project rubric.

Students will be graded on their informational essay using the rubric below.

Mouse trap car Example and explanation:



This is a finished working mouse trap car. CD's were used as the wheels. The thinner the wheels, the faster and farther the car will travel.



The mouse trap handle is broken and straightened out like a paperclip that has been unfolded. Glue or tape a empty plastic tube or pen container around the metal rod for safety. The string is tied at the end of the rod. This serves as the "Lever" for the car.



Take the other end of the string not tied to the lever and wrap it around the back axel by pulling the car in a reverse motion. This creates potential energy. When you release your grip on the lever being pulled back, the car will slowly unwind the string and move forward.

Project Rubric:

4	3	2	1
Use evidence to construct an explanation relating the speed of an object to the energy of that object.	Use evidence to construct an explanation of speed of an object but unable to connect to energy	Unable to provide evidence of explanation of speed of an object	No evidence of explanation
Ask questions and predict outcomes about the changes in energy occur when objects collide.	Predict outcomes but lacked question about changes in energy	Able to ask few questions about energy.	No evidence of predictions or questions
Apply scientific ideas to design, test, and refine a device that comes from energy from one form to another.	Able to design and test model but unable to refine idea.	Able to design model on paper but unable to construct.	No evidence of scientific ideas.

Informational essay rubric:

Description	Score (4,3,2, or 1)
Able to write down directions as to how each group built their car	
Able to explain how each part of their car contributed to how fast and far the model went.	
Able to relate energy to speed and distance of an object.	